

APPENDIX H

Range Management Guidelines

Foundational Elements for the Development of the
Hallelujah Junction Wildlife Area Grazing Plan

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Range management is not a static, one-size-fits-all process. To be effective, it is site specific and includes annual planning, monitoring, evaluation, and modification. The Range Management Guidelines for the Hallelujah Junction Wildlife Area are intended to be used in conjunction with the HJWA Land Management Plan to provide the wildlife area managers with the tools needed to develop an adaptive range management and monitoring plan. Additional planning will be required to fully develop and implement a range management plan for the Wildlife Area; specifically, a state licensed Certified Rangeland Manager will be required to assist with preparation of the range management plan.

BACKGROUND

HJWA Land Management Plan

The Land Management Plan (LMP) for the Hallelujah Junction Wildlife Area (HJWA) provides the context for development of a prescriptive range management plan for the Wildlife Area. It describes the management goals for the Wildlife Area, the geographical and cultural setting, the plant communities and species present or likely to occur, and special management considerations. An adaptive management plan, the HJWA LMP includes implementation of a monitoring program to assess whether the various management goals are being met and provisions to adapt management strategies over time to changing site conditions. Livestock grazing is an historic use of the Wildlife Area and CDFG is interested in continuing this practice as long as it is compatible with the mission, purpose and biological goals of the Wildlife Area (Jim Lidberg and Terri Weist, CDFG area managers, personal communications). Issues of particular concern include:

- Provision of habitat for wintering and migrating mule deer
- Control of invasive non-native plant species
- Protection for special-status wildlife
- Restoration of lands damaged by wildfire
- Riparian habitat protection and restoration

Legal Issues

California Senate Bill 1094 (1994) requires that a Certified Rangeland Manager (CRM) provide rangeland consulting services on non-federal “forested landscapes” throughout the state. While there is ongoing discussion as to what is meant by forested lands (Bagley 2008, Huff 2008), the currently accepted interpretation is that land that supports at least 10% native tree cover (or that has the potential) constitutes a forested landscape.

The California-Pacific Section of the Society for Range Management oversees CRM testing and certification. CRM licenses are issued by the California Board of Forestry and Fire Protection. Covered range management activities include making management recommendations, developing conservation plans and management plans, and conducting other activities associated with

professional rangeland management when made by professionals who work in the private sector, universities, state agencies, and federal agencies when they are working on non-federal land (California Code of Regulations [CCR], Title 14, Section 1651).

Since HJWA is on state-owned land and technically meets the definition of a forested landscape, we recommend that a California licensed CRM take the lead on preparation of a fully integrated range management plan. The recommendations presented here provide the basic information needed to start a range plan that can be integrated with the goals and monitoring strategies of the LMP.

Current Grazing Operations

Green Gulch Ranch, operated by the Azevedo family (A-Spear Cattle Company) was acquired by CDFG in 2004 as part of the HJWA. The ranch is approximately 2,100 acres and has been a family-run livestock operation for several decades. The Azevedo family resides on the property and uses the ranch for seasonal (spring and summer) continuous grazing on irrigated pasture and some rangeland above the pastures. They move the cattle off site for the winter months.

Current Lease Agreement

The Sierra Valley Resource Conservation District manages the grazing lease on behalf of CDFG. The current lease is for five years, with a five year option from the lessee. CDFG can terminate the lease if livestock grazing is determined to be incompatible with management of the property for wintering mule deer or other special-status species.

Range Plan Development

The range management guidelines for the HJWA are based on the concepts of ecosystem management (Keystone Center 1996, Grumbine 1997, Knight et al. 2002), the ecology of California's native perennial grasslands (King 1989; Edwards 1992; Edwards 1996; Kinney 1996; Hamilton 1997; Holstein 2001), the historic use of the site, and the desired landscape goals for the Wildlife Area (see HJWA LMP). The process of developing a biologically-based range management plan includes the following:

- Identification of the desired future landscape for the HJWA.
- Consideration of the site's historical land use, and the current facilities and infrastructure to implement planned grazing.
- Commitment to adaptive management: Managers must be flexible and have control over livestock behavior and stocking rates. Lack of control can result in the overgrazing of desirable species which may enhance invasive non-native plants or allow new invasive plants to become established (National Research Council 1994; Reed et al. 1999; Gadzia and Sayre 2007; Gadzia and Graham 2008).
- Creation of a tailored rangeland monitoring program (National Research Council 1994; Roberson 1996; Reed et al. 1999; Orchard and Mehus 2001; Bartolome et al. 2002; Gadzia and Graham 2008).

Desired Future Landscape Vision

The vision statement was the result of a half-day workshop held at the HJWA office on April 27, 2007 with CDFG representatives Jim Lidberg and Jan Dawson, Byrd Harrison (Sierra Valley Resource Conservation District), Manual Azevedo (A-Spear Cattle Company), and Sustain Environmental Inc. The workshop was facilitated by Kent A. Reeves, a Society for Range Management (SRM) Certified Professional in Rangeland Management and Certified Wildlife Biologist, and patterned on the recommendations of Savory and Butterfield (1998), Butterfield et al. (2006), and Gadzia and Graham (2008). The primary workshop goal was to identify a shared future vision for the Wildlife Area.

The workshop started with the basics: identifying the physical landscape, the influential agencies and decision makers, and the resource base for managing the Wildlife Area (financial as well as individual and group capabilities). From this foundation, the group identified shared quality of life goals as well as the short and long-term vision for the Wildlife Area that supports these goals, their “desired future landscape vision.” The workshop minutes are on file at CDFG’s HJWA office. Based upon this exercise, the resource team identified six primary goals for the Wildlife Area that can benefit from planned grazing:

- Enhance and maintain wintering mule deer habitat
- Increase vegetative cover
- Control erosion
- Curb the spread of invasive species
- Improve livestock production
- Restoration and enhancement of native riparian corridors

Preliminary Condition Assessment

In June 2007, a follow-up field meeting was held with Jan Dawson (CDFG) and M. Azevedo to discuss the current livestock operations, and to conduct a preliminary range condition assessment. The ranch supported 450 head of stocker cattle, 80 Corriente steers with 5 bulls, and 160 cow-calf pairs with 9 bulls during 2007 (M. Azevedo, personal communication).

Grazing operations have been mostly restricted to the historic ranch property, where there are eight pastures. Four of these pastures are irrigated and four are dry. CDFG recently installed fencing along Balls Creek to exclude livestock grazing and has undertaken a riparian restoration project along this section of creek. In 2007, five pastures were visited to assess the overall quality. In each pasture, managers estimated the area of land required to provide the volume of forage to support one cow-calf pair for one day (this is the Animal Unit Requirement [AUR]). Table 1 presents the various pastures with size estimates and estimated AUR.

Table 1. HJWA pastures, 2007

Pasture Name	Irrigated/Dry	Estimated Total Acres ¹	Estimated AUR ²
Brush Field 1*	Dry	120	65
Brush Field 2*	Dry	120	30
Lower Field*	Irrigated	100	15
Big Field	Irrigated	450	15
W House Desert*	Dry	500	20
North Desert*	Dry	2000	20
Corral	Irrigated	200	15
40 acre	Irrigated	40	15
Total estimated pasture acreage		3530	

¹ Pasture acreage has not been measured or mapped, pasture names are not official.

² AUR's are based on field estimates

* Pastures visited in June 2007

Animal unit requirements are used to determine the animal days per acre that the land can support. Animal days/acre is a function that incorporates both volume forage and time: the higher the animal numbers or the longer the period of grazing, the greater volume of forage removed. Animal days/ acre calculations are best used during the dormant season or drought conditions and can support key decision making including:

- Assessing pasture qualities relative to one another
- Determining if a pasture can support future grazing
- Dormant season planning
- Reassessing pasture quality after grazing
- Emergency planning in case of fire or drought
- Weighing different management policies
- Accounting for wildlife needs
- Setting stocking rates

A visual assessment of several pastures identified the following management concerns:

- Herbaceous vegetation was sparse between sagebrush plants in the dryland pastures. Although common in arid landscapes, this may indicate a poorly functioning water cycle and mineral cycle.
- There was considerable fecal buildup on the soil, indicating little or no breakdown of dung, another strong indication of a poorly functioning mineral/nutrient cycle.
- There was little to no bitterbrush regeneration in areas with little or no grazing, a possible indication of poor succession and reduced biodiversity.

Next Steps

Completion of a range management plan requires additional site-specific ecological information that is currently lacking, including focused surveys for special-status species and natural communities, and mapping the locations of protected cultural resources, above and below-ground hydrology, existing infrastructure, erosion hazards and sites, and management problem areas in relation to the planned grazing. Additional information is needed concerning the current livestock operation, especially the number of livestock on each pasture and the frequency that they are moved. The

pastures need to be accurately mapped and quantified, and water sources need to be identified. It is important to assess the forage value and phenology of native species for wintering mule deer and other species. Some of this preliminary ecological data has been collected during development of the HJWA Land Management Plan (Table 2), but more detail is needed to formulate the range management plan.

Table 2. Native Grasses at the Hallelujah Junction Wildlife Area and Their Importance to Wildlife and Livestock

Scientific Name	Common Name	Importance to Wildlife and Livestock
<i>Achnatherum hymenoides</i>	Indian ricegrass	Considered good forage value for livestock and native ungulates, seed is important food source for many species of wildlife (Tirmenstein 1999).
<i>Achnatherum thurberianum</i>	Thurber needlegrass	Valuable forage for livestock and many species of wildlife. Produces a fairly large amount of leafage that is usually of "good," although not choice, palatability for all classes of livestock. It is most palatable in the spring and early summer while the plants are young and succulent (Archer 2000).
<i>Alopecurus aequalis</i>	Shortawn foxtail	Considered a good forage plant for domestic livestock (USGS 2006).
<i>Deschampsia danthonioides</i>	Annual hairgrass	Waterfowl and birds eat the annual hairgrass seeds; however, the foliage may be of less value for wildlife herbage and cover compared to other grasses because of its short stature, lifespan, and limited productivity. The palatability and nutritional value of annual hairgrass for livestock and game is not documented (Darris and Bartow 2008).
<i>Distichlis spicata</i>	Saltgrass	Saltgrass is a wiry, coarse grass with low palatability. It is utilized only when more desirable forage is unavailable. While largely unpalatable, it is relatively high in protein. Livestock generally avoid saltgrass due to its coarse foliage, and it is minimally utilized by ungulates. Seeds and rhizomes provide an important food source for waterfowl (Hauser 2006)
<i>Elymus elymoides</i> spp. <i>elymoides</i>	Squirreltail grass	Squirreltail is a dietary component of several wildlife species. It is a minor component of bison and cattle summer diets within sagebrush rangelands. Although of little importance, bottlebrush squirreltail may provide forage for mule deer and pronghorn. Townsend's ground squirrels, Nuttall's cottontails, and black-tailed jackrabbits all feed upon bottlebrush squirreltail. The long sharp awns of bottlebrush squirreltail greatly reduce its palatability, and may penetrate flesh around the mouth of grazing animals, producing inflammation (Simonin 2001).
<i>Glyceria striata</i>	Fowl Manna grass	Palatability of <i>G. striata</i> is rated good to very good for cattle and horses which consume both flower stems and leaves. The seed is food for waterfowl and birds while the foliage and tall stems provide good wildlife cover. Foliage is seasonally grazed at a light to heavy rate by deer, muskrat, and bears. Some strains or populations of <i>G. striata</i> may contain cynogenetic compounds and cause cyanide poisoning in cattle, so caution is warranted (Darris 2006).
<i>Leymus cinereus</i>	Great Basin wildrye	Early growth and abundant production make Basin wildrye a valuable source of forage for livestock and wildlife. Though unpalatable during the winter, basin wildrye may be utilized more frequently by livestock

Scientific Name	Common Name	Importance to Wildlife and Livestock
		and wildlife when snow has covered low shrubs and other grasses. It has been identified as valuable winter forage for mule deer and provides summer forage for blacktailed jackrabbits and rodents (Anderson 2002).
<i>Leymus triticoides</i>	Beardless wildrye	Considered palatable to all livestock. Growth is initiated in early spring and continues at a maximum rate until mid-summer. Leaves remain green into fall (Smoliak et al. 2008).
<i>Muhlenbergia asperifolia</i>	Scratchgrass	Scratchgrass is highly palatable to both livestock and wildlife. It is an important seed source for songbirds, waterfowl and small mammals (Hershdorfer et al. 2007).
<i>Muhlenbergia richardsonis</i>	Mat muhly	Young mat muhly is readily eaten by livestock. Plants become less palatable as they mature. Usually grows in scattered patches, so it is seldom sufficiently abundant to be of major importance for livestock. Considered to be poor quality forage for mule deer (Alekssoff 1999).
<i>Poa pratensis</i> (May be naturalized in the Western U.S.)	Kentucky bluegrass	Highly palatable to most large grazers during the spring when it is green and succulent, palatability is much reduced when semi dormant in the summer. In moist mountain meadows, its palatability remains somewhat high during the summer. Leaves and seeds are eaten by many species of small mammals and songbirds, considered good forage for mule deer (Uchytel 1993).
<i>Poa secunda</i> spp. <i>secunda</i>	Sandburg bluegrass	Widespread and highly drought-resistant forage grass. It is one of the earliest grasses to green up in spring and is sought by all classes of livestock. Matures early and remains choice for a shorter time than other forage bunchgrasses. Horses and cattle continue to make some use of it during the summer months (Howard 1997).
<i>Poa wheeleri</i>	Wheeler's bluegrass (also called Hooker's bluegrass)	As with other bluegrasses, Wheeler's bluegrass is considered highly palatable to most large grazers (livestock and native ungulates).

Source: Derived from Hallelujah Junction Wildlife Area Land Management Plan, Appendix D (Plant Inventory)

The HJWA LMP provides direction to implement collection of these critical data as well as general and specific resource monitoring strategies (Chapters IV and V). Planning should include two parts:

1. Development of a stand-alone Range Management Plan that can be used as the reference for the livestock management strategy.
2. Subsequent annual updates to modify the overall plan and determine tactical decisions for the next grazing period.

An appropriate range management prescription for the HJWA should control the timing and intensity of cattle to benefit ecosystem processes and ultimately the native vegetation and habitat for mule deer. A licensed CRM¹ should review the ecological site information, biological goals and biological

¹ The California Board of Forestry and Fire Protection requires a license (Certified Rangeland Manager) for professionals conducting rangeland management, planning, and conservation activities on non-federal rangelands that support or have the potential to support tree cover. A certified rangeland manager is a competent professional obligated to protect the public interest, to follow the code of professional ethics of the Society for Range Management, and to participate in the Society for Range Management and continuing education. Refer to <http://www.casrm.org/certified.html> and http://www.fire.ca.gov/cdfbofdb/licensing/licensing_current_docs.aspx for more information. Although the state resources code might not apply to all of the HJWA, we recommend that it would be useful and efficient to employ a licensed

monitoring tasks within HJWA LMP as this provides the whole context for range management planning.

Annual grazing plan updates and modifications should be done by the grazing tenant and CDFG management staff at least two months before livestock are brought to the HJWA (Gadzia and Sayre 2007). The first planning session should be facilitated by a CRM experienced with planned grazing, and will require attendance for one full day by CDFG management staff and the grazing lessee.

An annual planning session will include the use of the range management plan to determine tactical decisions, including how much of the HJWA will be grazed, the number of pastured animals, the length of time they should remain in a given area, and the length of time before the pasture is grazed again. Key to this tactical planning is the ability of the lessee to move the livestock where and whenever necessary. Tools to manipulate livestock include fencing, herding, watering systems, and supplemental feeding. Several of the forage area calculations will be performed per pasture, averaged, and then the average used to calculate the animal days/acre that the pasture can support and still provide wildlife habitat value (ibid.).

Range Monitoring and Health Assessments

The range management plan will include an appropriate monitoring program to ensure that the goals and objectives of the Wildlife Area are being met. Range conditions should be monitored continually, but objectives and trends should be formally evaluated at least every three years. Many of the monitoring strategies outlined in the HJWA LMP are applicable to range management and can be integrated into the range plan. The key indicators of rangeland health are based upon ecological processes such as soil stability and watershed function, nutrient and energy cycle, and plant recovery mechanisms (Table 3).

Table 3. Key ecological processes, criteria and indicators of rangeland health

Ecological Process	Criteria	Indicators
Soil stability and watershed function	Soil movement by wind and water	Presence of soil A-horizon Rills and gullies Pedestaling Scour or sheet erosion Sedimentation
Nutrients and energy distribution	Spatial distribution of nutrients and energy	Plant distribution Litter distribution and incorporation
	Temporal distribution of nutrients and energy	Rooting depth Photosynthetic period
Plant recovery mechanisms	Plant demographics	Age and class distribution Plant vigor Germination and presence of microsites

Source: National Research Council 1994

Monitoring will provide refinement and a more accurate assessment as the range management program matures. A realistic monitoring program that can be implemented and maintained by CDFG staff and the grazing lessee should be developed based on time, resources and financial considerations

rangeland manager to assist with that work because of the technically challenging nature of the monitoring, data analysis, management assessments, and plan modifications.

(Gadzia and Graham 2008). Monitoring rangeland health need not be overly complicated. Many of the key indicators can be examined visually and ranked according to the matrix in Table 4.

Table 4. Matrix of indicators of rangeland health

Indicator	Healthy	At Risk	Unhealthy
Soil Stability and Watershed Function			
A Horizon	Present and unfragmented	Present but fragmented distribution developing	Absent, or present only in association with dominant plants or other obstruction
Pedestaling	No pedestaling of plants or rocks	Pedestals present, but on mature plants only; no roots exposed	Most plants and rocks pedestaled; roots exposed
Rills and gullies	Absent, or with blunted or muted features	Small, embryonic and not connected into a dendritic pattern	Well defined, actively expanding, dendritic patterns established
Scour or sheet erosion	No visible scouring or sheet erosion	Patches of bare soil or scours developing	Bare areas and scours well developed and continuous
Sedimentation or dunes	No visible soil deposition	Soil accumulating around plants or small obstructions	Soil accumulating in large barren deposits or dunes or behind large obstructions
Distribution of Nutrient Cycling and Energy Flow			
Plant distribution	Plants well distributed across site	Plant distribution becoming fragmented	Plants clumped, often in association with prominent individuals; large bare areas between clumps
Plant litter distribution and incorporation	Uniform across site	Litter associated with prominent plants or obstructions	Litter largely absent
Root distribution	Plant community structure results in rooting throughout the available soil profile	Roots are absent from portions of the available soil profile	Community structure results in rooting only in one portion of the available soil profile
Distribution of photosynthesis	Occurs throughout the period for plant growth	Mostly occurs during one portion of the period for plant growth	Little or no photosynthesis on location during the period suitable for plant growth
Plant Recovery Mechanisms			
Age-class distribution	Distribution represents all species, most species are desired	Seedlings and young plants missing	Primarily old or deteriorating plants present, invasive non-natives present
Plant vigor	Plants display normal growth form	Plants developing abnormal growth form	Most plants in abnormal growth form
Germination microsite	Microsites present and distributed across site	Developing crusts, soil movement, or other factors degrading microsites, developing crusts are fragile	Soil movement or crusting sufficient to inhibit most germination and seedling establishment

Source: National Research Council 1994, Gadzia and Graham 2008

Along with conducting visual assessments and ranking rangeland health indicators, collecting quantitative data can be extremely useful to reveal changes and guide future management strategies. Of particular value are permanent photo plots, measurements of basal cover, plant spacing, and plant species diversity. Plant cover, spacing and species diversity are best measured using linear transects (Elzinga et al. 2001). Gadzia and Graham (2008) provide excellent instructions on setting up and conducting quantitative monitoring plots.

Permanent photo points should be established in each pasture to document existing conditions, evaluate changes and provide the basis for adaptation of management strategies over time. The locations for photo plots should be permanently marked in the field and mapped using a handheld global positioning system (GPS) for inclusion in the GIS database for the Wildlife Area. It is imperative that the photographer stands in the same location each year and that the photos are taken during the same season every year.

Monitoring Frequency

There is no one answer regarding how often a qualitative rangeland health assessment should be performed. Gadzia and Graham (2008) recommend the following guidelines:

- Twice per year following fire, herbicide treatment or other vegetation treatment.
- One per season when implementing a new grazing regime.
- Once every three years for general information gathering and early-warning detections.
- Once every five years in areas with less than 10 inches of precipitation per year.

Adaptive Management

Habitat management strategies that use grazing animals must be monitored and adjusted to accommodate variation among site types co-occurring within a pasture. Phenological differences among different pastures of the same type may change over the course of a season or year. Interannual variation will similarly dictate changes in timing, period of stay, etc. for each pasture each year.

Grazing regimes of different intensity and timing impact plant species uniquely based on their life history characteristics. For this reason, it is important to integrate this LMP's weed management plan (Appendix E) with all grazing efforts. Early blooming plants may benefit from later-season grazing, while later blooming plants may reproduce well with the opposite treatment. Taller plants may better succeed under grazing regimes of short duration, while shorter plants may easily endure regimes of longer duration. Management prescriptions that encourage a spectrum of grazing disturbance may facilitate conservation of more native species across the landscape (Hayes and Holl 2003).

Summary

To ensure compliance with state law, preparation of the HJWA Range Management Plan should be undertaken by a California licensed CRM. The annual updating of the Range Management Plan will require a minimal commitment on the part of the HJWA staff and grazing tenant, but will provide a powerful tool for meeting the ecological, social, and economic vision developed for the Hallelujah Junction Wildlife Area.

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